were available with them. As on 31.3.2005, funds to the tune of Rs. 122.00 lakh are available with Gujarat State Disaster Management Authority. No balance is available with the Ministry of Statistics and Programme Implementation.

Impact of tsunami

*264. SHRI JANARDHANA POOJARY: Will the Minister of OCEAN DEVELOPMENT be pleased to state:

(a) whether any scientific analysis has been carried out for ascertaining the impact and havoc brought by the recent tsunami in the country;

(b) if so, the details in this regard;

(c) the measures that are contemplated to forecast tsunami and such other disasters in future and to meet the challenges thrown by such disasters in the future;

(d) whether experts have suggested creating mangroves on the shores to minimize the impact of tsunami; and

(e) if so, the details in this regard and Government's reaction thereto?

THE MINISTER OF STATE OF THE DEPARTMENT OF OCEAN DEVELOPMENT (SHRI KAPIL SIBAL): (a) and (b) Yes Sir. A total of 2260 line km. of coastal length was impacted by the 26th December, 2004 tsunami which included the entire coast of Andaman and Nicobar Islands and parts of Tamil Nadu, Andhra Pradesh, Kerala & Pondicherry. An estimated 12407 human lives were lost. Estimated loss in monetary terms including damage to property amounts to Rs. 11544 crores.

Preliminary scientific assessment of the impact of tsunami has been conducted by various institutions and Government Departments on infrastructure and environment in the coastal areas of Andaman and Nicobar Islands, parts of Tamil Nadu, Kerala and Andhra Pradesh. The Department of Ocean Development's vessels ORV Sagar Kanya and FORV Sagar Sampada were deployed for studying the impact of tsunami on ocean environment and its resources in the Bay of Bengal and Arabian Sea during January—February 2005. The multi disciplinary and multi parameter data collection was so planned as to cover areas for which pre-tsunami data was available and also to collect new data in new areas.

The tsunami waves have caused changes in the biological community of the coastal areas by transporting biological organisms from one area to other area along the same coast. These changes are likely to be short-term. The coral reefs of South Andaman Islands have been found to be damaged and covered with debris, mud and sand. There has been no significant impact on demersal fisheries. Coastal water quality investigations have indicated enrichment of nutrients and contamination by bacteria in the near shore waters of Tamil Nadu. Reverse trend was observed for water quality along Kerala Coast.

(c) It has been proposed to set up a Tsunami and Storm Surge Early Warning system with the following components:

- Strengthening of the existing seismological network to indicate in near real time occurrence of tsunamigenic earthquakes.
- Installation of tsunami warning sensors close to the ocean bottom at appropriate locales in the Indian Ocean, with real time connectivity.
- Tide gauge and data buoys networking to validate arrival of tsunami waves at the coast.
- Modelling of the inundation scenarios for the entire coast and mapping of potential risk areas
- The establishment of a centre for collection of information, analysis and generating status advisories.

The warning system is scheduled to be operational by September 2007.

The system will require 10-12 Bottom Pressure Recorders (BPR) close to the ocean bottom with complementary floating data buoys with real time connectivity. Tide gauge networking has already been initiated and six of these with real time connectivity have been operationalised so far. The specifications of BPR and data buoys have been finalized.

(d) and (e) the experts have suggested creation of bio-shield with appropriate vegetation including mangroves along the coast to minimise the impacts of tsunami. Under the mangrove Management Action Plan of the Ministry of Environment and Forests, 35 mangrove areas in the country have been identified for intensive conservation and management.